JP 62236937

Compositions for Termite Control

Shikinami, Yasuo; Hata Kunihiro; Uchiumi, Kiyoshi; and Kimura, Hiroshi
Takiron Co. Ltd. Japan; Earth Chemical Co. Ltd. Japan; Kokai Tokkyo Koho

ABSTRACT

A mixture containing a termite controlling agent, polyols (urethane prepolymer), and microparticles is blended with a liquid containing isocyanates (urethane prepolymer) and applied to the foundation of a building during construction for prolonged control of termites. A mixture containing polyols (mol. Wt. 700) 100 dibutyltin laurate (catalyst) 0.05, 50 parts isocyanate for application to concrete blocks of a foundation.

1. Title of the Invention

The **method** for the application of a termite-controlling agent.

2. Scope of the Patent Request

The patent specification is (or specifies) the method that the solution containing insecticide, microparticles, and a polyol component as a urethane prepoylmers is mixed with the solution containing isocyanate which is as a urethane prepolymer and the mixture is applied on the surfaces of the building foundation and of the foundation surrounding ground by painting or spraying. The applied solution will be then solidified on the surfaces and acts as a termite controlling substance.

3. Detailed Explanation of the Invention

(Applicability)

This invention will prevent the termite infestation of building for a long period of time by the pesticide application method mentioned here.

(Conventional Technology)

Currently, the prevention of termites is done by applying a pesticide solution or powder to the ground. The other method is to treat building materials with pesticide. The very recent approach is in development to use a plastic material containing a pesticide laid on the ground or glued on the foundation. These current pesticide applications or development however have problems.

Applying directly to ground, the high concentration of pesticide is required in order to have the long lasting termite control. The high concentration of the pesticide in the ground is causing contamination of the pesticide in ground water or in wells. The exposure during application of the concentrated pesticide also causes a health risk to the workers.

Using pesticide treated materials has its own problems. The process of treating building materials is expensive. In addition, the lasting effectiveness of the treatment is doubtful. The idea of using pesticide-containing plastic may have cost and effectiveness problems. The process of putting the plastic on the building foundation is difficult and costly. Having even a pinhole break in the plastic gives a chance to create a termite trail.

Another method is the application of a pesticide containing polyurethane foam. This method has also a problem that the foam can be penetrated by water. Secondly, a termite trail can be easily made through the foams. Third, the rapid polymerization of the urethane produces heat and may degrade the potency of the pesticide. The control of the pesticide release through the urethane foam is uncertain. Because of the rapid rate of urethane polymerization, it is unable to control the foam pore size that affects the pesticide release. Finally, urethane foam becomes brittle and may not have durability and lasting effects.

(The solution to the problems)

To solve the problems, our invention came upon the application method that creates a solidified film on the surface of the building foundation and the ground surface nearby by painting or spraying the solution that was made just prior to application by mixing the solution containing polyol (urthane prepolymer), pesticide and microparticles and the solution of isocyanate (urethane prepolymer). The solidified pesticide-containing film will prevent a building from termite infestation.

(The effect)

By solidifying urethane polymer and the pesticide together, the pesticide is contained in a solid substance and will not be washed out by rain. Therefore, a high concentration of pesticide can be used in the pest control application. Having a high dose of the pesticide content, the area that is applied can be minimized and still it will give an effective protection.

Furthermore, inclusion of microparticles creates gaps between the particles. The gaps are filled with the pesticide containing urethane polymer. Therefore the urethane polymer containing the microparticles acts as a sponge and enables the release of the pesticide without trapping it. By the varying the amount of the microparticles, it can change the rate of the pesticide release.

(Implementation)

The procedure of the termite-controlling agent application in our invention is as follows. The application material consists of two solutions; one is containing polyol as urethane prepolymer, pesticide and microparticles and the other is the solution of isocyanates. Upon mixing the two solutions, it is painted or sprayed on the surface of the foundation and the ground around the foundation and then solidified on them creating a urethane polymer film.

Because the urethane polymer does not contain solvent, it can solidify at room temperature. This will prevent vaporization of the pesticide. Furthermore, it benefits the industrial process of manufacturing the solutions.

As a pesticide, for example, a group of chlordan, dyldrin (??), and aldrin or a group of phoxin, phenytoin, ciafos, acephate, chlorpyrifos and permethrin are suited. As a pest repellent, di-ethylmethly amide can be used. 0.5 to 6 % (wt to wt ratio) of the insecticide is mixed in urethane polymer. More than one insecticide can also be mixed in the solution.

For the microparticles, neutral metal oxide particles such as Al $(OH)_3$ are preferred to prevent them from reacting with the insecticide. However alkaline particles such as $MgCo_3$, Calcium silicate, silicon dioxide, talc, diatomaceous earth can be used when they are treated with coating materials as chiton or silene group. Acidic, inorganic microparticles also can be used.

Microparticles play a role in forming the pesticide-releasing passage and control of the pesticide release. They also provide the plasticity and the mass to the insecticide-controlling agent. The microparticles are included as 30 to 80 % of the weight of urethane polymer, preferably 50 to 70 % (weight to weight ratio). Moreover, combining the bigger sizes, 50 to 150 micron and the smaller sizes, 5 to 50 microns, particles in a proper proportion are highly desirable. By mixing the two different sizes of the particles, the smaller size particles will be randomly distributed in the spaces created by the bigger particles leaving the gaps. As the gaps are filled with urethane polymer, it forms the pesticide releasing micro-passage. This micro-passage can affect the control the pesticide release and prevent trapping of the pesticide in the polymer. It also reduces the pesticide loss from the surface of the polymer. Furthermore, the presence of the smaller particles reduces the viscosity of the solution. More small microparticles can be added.

As an example of isocyanate component, isocynate prepolymer is made by reacting tri-methylol propane (1mole) with xylene-di-isocyanate (3.2 mole). Isocynate prepolymer with the molecular weight of 700 dalton is ideal. As an example of the polyol component, polyethylpolyol made by reacting di-ethyleneglycol (0.9mole) , glycerin (0.3 mole) and azipin (?? Not found english equvalent)(1.0 mole). The molecular weight of 700-dalton polyol is also suited.

For other examples of isocyanate component such as p-phenly-di-isocyanate, toluene -di-isocyanate,4,4,-di-phenylmethane-di-isocyanate, tri-isocyanate, xylene-di isocyanate etc. or hexamethylene-di-isocyanate, lysine-diisocyanate can be reacted with polyol (ester or ether) to make the isocyanate compound that has three functional groups. The molecular weight for the compound is 500 to 3000 dalton, preferably isocyanate of M.W.700 to 2000 dalton.

As other example of polyol component, ethylene glycol, di-ethylene glycol, tri-ethylene glycol, propylene glycol, di-propyleneglycol, butylene glycol, hexamethylene glycol or glycerin, trimethyolpropane, tri-methylol ethan, 1,2,6-hexane-triol, pentaerythitol etc can be reacted with a chemical containing di-carboxyl acid group such as myristic acid to form polyol prepolymer containing three functional group. The molecular weight of the polyol formed is 500 to 5000 daltons. 700 to 2000 daltons is preferred in this application.

As various types of isocyanate and polyol components are described, choosing appropriate isocyanate and polyol components sets the desired and pesticide compatible mixture. This improves the effectiveness of the pesticide release. Also, by the selecting the right molecular weight, the solidified urethane polymer will obtain elasticity that reduces the breakage of the polymer.

In polyol containing solution, a catalyst such as di-n- butyl-di-laurate or tri-ethyl amine (0.1 to 1 %) is added.

For application to the building, the equal amount of polyol and isocyanate components and an adjusted amount of pesticide were mixed. The mixed solution is applied or sprayed. Ideally, it is better to use the sprayer that has a mixing function, which that function can mix the two solutions from the two compartments in which the solutions are housed separately. It will be more effective to spray the solution as the two solutions are mixed.

It is recommended that the applying area on the concrete foundation should be 10 cm or higher from the ground and a total of 20 cm or more including by the coverage of the surrounding ground. After applying by painting or spraying, it will solidify as early as 20 minutes as late as 3 days at room temperature. However for considering the time frame of building construction, it is better to be solidified in 3 to 6 hours.

(Experiment and Result)

A polyol component (700 dalton) as a urethane prepolymer, di-butyl-laurate as a catalyst, microparticle, $Al(OH)_3$, and the pesticide phoxin were thoroughly mixed in ratio of 100 : 0.05 : 225 : 5.5 by weight, respectively. Then the mixed solution was combined with isocyanate component of urethane prepolymer (700 dalton) 50 parts to prepare the termite-controlling agent.

As a test object (Fig 1), the concrete block (10, 20, 40 cm in dimension) was buried in the ground up to half way. On the block, pinewood in the dimensions of 10, 20, and 10 cm was placed. A set of the two test objects was covered with a non-transparent plastic box to avoid the light. One of the two was treated with the pesticide-controlling agent (Fig 1A) and the other (Fig 1B) was not. (2 and 6, pine wood; 1 and 5, concrete block and concrete foundation; 4, pesticide treated area; 7, ground surface; 3, plastic box covering; l_1, and l_2, pesticide applied length). Placing the five sample sets of each experimental setting tested eight experimental settings (Table 1) that were differing the length and the thickness of the pesticide application. The samples were placed around the termite mound in the pine forest in Kagoshima Pref. 12 months after placing the test samples, only one out of the 40 treated samples showed a termite trail. But the others show no termite trail. Furthermore none showed the termite infestation, even in the pinewood.

As shown in the result, our invented application method is very effective for the termite infestation prevention.

As for the building's concrete foundation (shown in Fig 4), complete prevention of termite infestation requires that the insecticide agent will be applied on all the sides of the foundation under the floor (for safety). In that case, the applied length on the side of the foundation above ground is 10 cm. The total length of the application has to be at least 20 cm combining the length on the side of the foundation and the application length on the ground. The thickness of the pesticide agent greater than 0.7 mm will give long-lasting pest prevention.

This superior application method costs less and reduces the health risks for the worker compared to the conventional large ground area pesticide spraying.

(The Effectiveness of the Invention)

According to the invented termite application method as described above, the polyol, pesticide and microparticles containing solution is mixed with isocyanate solution during the application to the surfaces of concrete foundation and the foundation surrounding ground where termites potentially invade and the mixture is solidified on the surfaces. The hardened urethane polymer substance prevents pesticide wash out from the polymer by rain and the rapid leaching out of the polymer to the ground. It also eliminates the health risks by reducing the pesticide inhalation by the workers during the application of termite controlling agent.

The prevention of the pesticide loss makes a possible to use a high dose of pesticide. With the high pesticide concentration, one can reduce the area where the termite controlling agent need to be applied instead of spraying a large area. The termite infestation can be prevented for a long duration by applying it only on the small surface area along the all sides of the concrete foundation, or on the limited ground area adjacent to the foundation. Moreover it is not labor intense and costs less since the required application area is minimized.

On top it, the formation of micro-passage made by the inclusion of microparticles increases the ability to release the pesticide gradually therefore provides the long lasting effect. The reduction of the cost can be also managed by including the microparticles.

This procedure can be easily applied to existing buildings by simply painting or spraying the properly mixed termite-controlling polymer agent, which also reduces the cost of building insecticide treatment.